

Appendix XV

COEFFICIENT OF VARIATION FOR TRI-LEVEL CONTROLS

Control values were analyzed on 15 different laboratory tests for the period from January 14 thru December 13, 1982. Triplicate values were collected on each laboratory test at each of three different ranges (I, II, and III) except for triglyceride and alcohol which each had only ranges II & III. These control data were received from 91 groups of study participants reporting for physical examination (usually 2 groups per week). A total of 91 sets of control values were received for II & III and a total of 78 for I.

A one-way analysis of variance procedure was used on each trilevel laboratory test to determine whether or not the data varied significantly among the 91 (or 78) groups. The error term used was the pooled variance ($\hat{\sigma}_e^2$) from the triplicate values recorded for each group. The group means differed significantly at the 0.01 level on nearly all of the analyses (40 out of 42). Hence, the variability among the groups was significantly more than can be explained by the variability among the triplicate readings.

A variance component for the group-to-group variability ($\hat{\sigma}_g^2$) was estimated from the one-way analysis of variance and the standard deviation of a single measurement/group was estimated as:

$$\sigma = \sqrt{\hat{\sigma}_e^2 + \hat{\sigma}_g^2}$$

Each coefficient of variation given in the table below was computed as:

$$CV\% = \frac{\hat{\sigma} \times 100}{\bar{x}}$$

where the \bar{x} is the mean of the control values for each trilevel/laboratory test. Ninety-five percent confidence limits were computed as follows:

$$\sqrt{\frac{N(N-1)v^2}{x^2 \cdot .025, N-1 [N+(N-1)v^2]}} \leq \frac{\sigma}{\mu} \leq \sqrt{\frac{N(N-1)v^2}{x^2 \cdot .975, N-1 [N+(N-1)v^2]}}$$

where v^2 is the square of the observed CV, $N = 91$ or 78 (depending on the trilevel of interest) and σ and μ are the population parameters associated with σ and \bar{k} respectively.

The interval for the CV%'s marked with an asterisk in the table below did not contain the USAFSAM required CV%, implying that the estimated CV% differed significantly from the required at the 5% level. The estimate exceeded the required on 12 of the 40 trilevel sets. The average CV% was not tested.

SAMPLE MEAN, STANDARD DEVIATION AND COEFFICIENT OF VARIATION
FOR TRI-LEVEL CONTROLS USED FOR 15 BIOCHEMICAL ASSAYS

Test	I		II		III		I	II	III	Average	USAFSAM Requirement CV%
	\bar{x}	σ^*	\bar{x}	σ	\bar{x}	σ	CV%	CV%	CV%		
BUN	6.6	0.296	16.6	0.415	45.9	0.702	4.50*	2.50*	1.53	2.84	2.00
Creati- nine	0.602	-	1.697	0.024	5.637	0.053	-	1.40	0.93	1.16	2.50
Glucose	49.4	0.719	100.2	1.408	212.6	1.457	1.46	1.41	0.69	1.19	3.50
Choles- terol	104.2	2.236	115.8	2.357	151.7	2.257	2.15*	2.04*	1.49	1.89	1.50
Triglyc- erides	-	-	72.39	1.869	177.4	2.464	-	2.58*	1.39	1.98	2.10
HDL	20.5	1.111	31.6	0.786	37.8	1.535	5.42*	2.48	4.06*	3.99	3.50
Total Bili- rubin	0.930	0.040	1.437	0.045	5.470	0.133	4.34*	3.12*	2.42*	3.29	1.50
Conju- gated Bili- rubin	0.400	0.043	0.811	0.043	2.383	0.110	10.74*	5.33	4.60	6.89	6.00
Alk Phos	5.274	0.203	9.855	0.273	28.37	.438	3.85*	2.77	1.54	2.72	2.70
SGOT	38.32	1.18	56.73	1.41	171.2	2.18	3.08	2.48	1.27	2.28	4.00
SGPT	28.16	2.697	26.65	0.999	101.6	1.133	2.70	3.75	1.12	2.52	5.00
CGPT	31.97	0.985	43.68	1.033	186.79	2.20	3.08	2.37	1.18	2.21	5.00
LDH	147.9	1.997	165.8	2.612	441.7	4.104	1.35	1.57	0.93	1.28	2.20
CPK	65.5	1.362	139.1	5.559	440.9	11.34	2.08	4.00	2.57	2.88	5.00
Alco- hol	-	-	48.5	0.749	99.2	1.518	-	1.54	1.53	1.54	-

* $P < 0.05$, reject the hypothesis that the sample CV% came from the population with required CV%